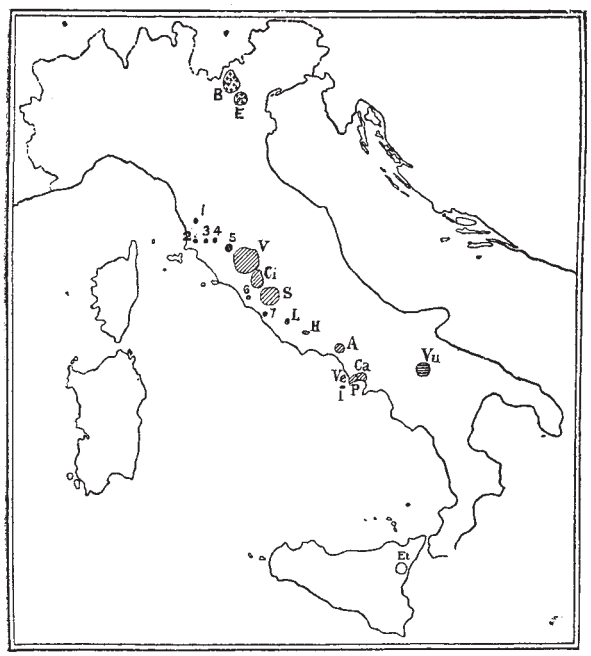
ITALIAN VOLCANIC ROCKS.[1]

ALTHOUGH the Tertiary and Recent volcanic tract along the western side of the Apennines is classic ground to the geologist no less than to the historian, we still possess only meagre information concerning the many remarkable, and often unique, rock-types for which these Italian volcanoes have long been famous. A comprehensive and connected study of a large part of the assemblage by a well-qualified authority is therefore peculiarly welcome. Dr. Washington has devoted much attention to the subject, both before and since the publication, ten years ago, of his "Italian Petrological Sketches."

"Comagmatic region" is synonymous with "petrographical province," and the author's reasons do not convince us of the necessity of abandoning a now familiar term. The Roman region is defined as extending from Lake Bolsena to the Phlegræan Fields; and probably few petrologists will dissent from the proposition that the community of characters among the volcanic rocks of this region points to a real genetic relationship of the several



Sketch Map of Italian Comagmatic Regions.

Roman Region.	V =Vulsinian District	Ve=Vesbian Volcano	5 =Monte Amiata		
	Ci=Ciminian District	P =PhlegræanFields	6 =Tolfa		
Tuscan Region.	S =Sabatinian District	I =Ischia	7 =Cerveteri		
	L =Latian District	1 =Montecatini	B =Berican Hills		
Venetian Region.	H =Hernican District	2 =Campiglia	E =Euganean Hills		
	A =Aurunican District	3 =Massa Marittima	Vu=Monte Vulture		
Apulian Region.	Ca=CampanianDistrict	4 =Roccastrada	Et =Etna		

magmas. The author separates, though somewhat doubtfully, the smaller "Tuscan region," lying farther to the north and west, which we hope will be the subject of a future memoir. It can scarcely be denied, however, that a certain community of characters unites all the Italian volcanic districts on this side of the Apennines (with Monte Vulture in the mountain-belt itself), the resemblance being emphasised by contrast with the rocks of the Euganean Hills on the opposite side of the main orographic line.

The body of the memoir before us consists of two parts. The first is purely descriptive, the several rock-types being treated in order, succinctly but thoroughly. The special features of this part are the quantitative element constantly introduced into the mineralogical descriptions, and the addition of a large number of new and carefully-made chemical analyses of the lavas. The peculiarity which has made the region famous in petrography is the abundance and variety of leucite-bearing rocks. The non-leucitic types are for the most part of trachytic affinities, though with a proportion of soda-lime-felspar which caused the author (in his former papers) to distinguish them under the names vulsinite and ciminite.

The second part of the memoir, discussing the mutual relations of the associated rocks, is headed "Petrology" (the first part being "Petrography"). It would seem more convenient to use the name petrology for the whole science of rocks, including the descriptive branch (petrography) and the rational. The author gives an interesting discussion of the facts which he has brought together, and touches on the genetic problems which underlie those facts. In particular, he attempts a calculation of the average composition of the magmas for the several districts and for the whole region. In the central part of the region all the lavas carry leucite, basic leucite-tephrites and leucitites being largely predominant; while at the two extremities of the region the trachytic types are in greater force. No definite order of succession in time can be made out.

While taking care to make his work intelligible to the ordinary petrologist, Dr. Washington employs throughout the methods and terminology of the Quantitative Classification, of which he is joint author. The memoir thus written does, as he claims, serve to make that system clearer by showing it in actual operation, and this is an incidental gain; but, although it is here seen at its best, as applied to a cognate collection of types, most of which possess strongly marked characteristics, we do not find our fundamental objections to the new classification weakened by a closer acquaintance with it. If a rigidly quantitative, and therefore artificial, classification be desirable, which we do not concede, it might be sought in the actual mineral composition of the rock (here estimated in most cases) rather than in the imaginary composition which is called the "norm." In reading the descriptions and discussions, it needs no very perverse fancy to construe many sentences as censuring Nature for departing from the "norm," or commending her for approximately conforming to it; and this air of artificiality must somewhat discount the usefulness of what is undoubtedly a very valuable monograph.

A. H.

[1] "The Roman Comagmatic Region." By Henry S. Washington. Pp. vi+199. (Washington: Carnegie Institution, 1906.)

INVERSION TEMPERATURES FOR AIR AND NITROGEN.

THE Bulletin of the Cracow Academy of Sciences for December, 1906, contains a preliminary note, by Prof. K. Olszewski, on the determination of the temperature of inversion of the Joule-Kelvin effect for air and for nitrogen when subjected to different pressures. The apparatus used was similar in principle to that adopted in 1901 in determining the inversion temperature for hydrogen, but details had to be modified owing to the necessity of working at much higher temperatures. The table which follows shows the inversion temperature of the gas when allowed to expand from the initial pressure p (expressed in kilograms per square centimetre) to the pressure of the atmosphere. Above the temperature t_i a thermo-element showed a heating effect on expansion, whilst below this temperature a cooling effect was observed.

Air		Nitrogen	
p	t_i	p	t_i
160	+259°	159	+243°
100	249	126	238
90	244	102	233
80	240	90	228
70	235	80	223
60	226	68	217
40	198	55	205
20	124	30	163

It is seen that the inversion temperature is a continuous function of the pressure, confirming the recent theoretical views of Witkowski and Porter. The value of the in-

version temperature for air, however, calculated by Witkowski from the empirical formula of Rose-Innes, was +360°, whilst the van der Waals formula was found to require an inversion temperature of +500°; in the latter case, however, the calculation is based on the assumption of a small difference of pressure (1 atmosphere) accompanying the expansion, whilst the experimental values refer to expansion over a wide range of pressure. The shape of the curve for air connecting the inversion temperature with the initial pressure at which expansion occurs shows that below 80 atmospheres a rapid fall of the inversion temperature occurs as the pressure is diminished. Very little cooling effect is therefore to be anticipated with air allowed to expand from pressures below 80 atmospheres; such, indeed, is actually observed to be the case, liquefaction only taking place readily in the apparatus described by Prof. Olszewski in 1902, so long as the initial pressure does not fall below this limit.

STUDENTS IN GERMAN UNIVERSITIES.

ACCORDING to the *Chemiker Zeitung*, the total number of matriculated students in attendance at the German universities during the present winter semester is 45,136, as against 44,942 last summer, and 42,390 in the preceding winter; five years ago the attendance was 35,518, ten years ago 30,043, twenty years ago 27,080, and thirty years ago, that is, in the winter 1876-7, it was only 17,457, upon which total the present number shows an increase of 27,679, or 159 per cent. It is of more than passing interest to compare the number of students at the different universities to-day with those of thirty years ago :—

	1906-1907	1876-1877		1906-1907	1876-1877
Berlin	8188	2490	Tübingen ...	1522	903
Munich	5567	1280	Marburg ...	1503	382
Leipzig	4466	3036	Würzburg ..	1407	1028
Bonn	2992	793	Jena	1275	439
Halle	2250	854	Königsburg ...	1140	621
Breslau	1961	1219	Giessen	1097	318
Göttingen ...	1831	991	Erlangen ...	1056	474
Freiburg ...	1744	293	Kiel	877	219
Strassburg ...	1652	707	Greifswald ...	827	468
Heidelberg ...	1603	473	Rostock... ...	645	156
Münster... ...	1533	313			

The distribution of these students in the various branches of academic study is as follows :—

	1906-1907	1876-1877
Law students	12215	4835
Art students	10873	3874
Medical students	7035	3374
Mathematical and science students ...	6116	2009
Evangelical theology	2208	1518
Pharmaceutical students	1865	680
Catholic theology	1708	1164
Students of economic sciences and forestry	1235	155
Agricultural science	985	369
Dentistry	870	8
Veterinary Science (only matriculated at Giessen)	110	0

Against these numbers it is to be remarked that the large number of applied and pure science students attending the Technische Hochschulen is not included here, while the number of arts students is too high by nearly 1000, owing to the modern custom in the Prussian universities' returns of including among such students those whom they place under the tabulation heading "Sonstige Studienfächer der philosophischen Facultät."

Out of a total number of 45,136 students in attendance at German universities during the present winter half-year, 4151, or 9·2 per cent., are described as foreigners, against 8·6, 8·4, and 7·5 per cent. in the preceding half-years. The absolute increase of 596 on the number for the corresponding semester of last year (namely, 3555) is almost exclusively due to an increase in the number of Russian students, who have increased from 1326 to 1890 in one year. Of the 3717 students belonging to European countries, 681 are from Austria, 341 from Switzerland, 144 from England, 139 from Bulgaria, 83 from Roumania, 61 from Servia, 58 from France, 57 from Holland, 53 from Luxemburg, 47 from Greece, 40 from Turkey, 33 from Italy, 32 from Scandinavia, 23 from Spain, 19 from Belgium, 9 from Portugal, and 5 from Denmark. From America, mainly from the United States, are 302; from Asia, chiefly Japanese, 113; from Africa, 13; and from Australia 6. The distribution of this foreign element at the universities is as follows :—

	Foreign students			Foreign students	
University	Number	Per cent.	University	Number	Per cent.
Berlin ...	1189	14·5	Giessen ...	84	7·6
Leipzig ...	662	14·8	Breslau ..	77	3·9
Münich ...	496	8·8	Würzburg	67	4·7
Heidelberg	259	16·1	Marburg	60	4·9
Halle ...	254	11·3	Tübingen	59	3·9
Jena ...	186	14·6	Greifswald	43	5·2
Göttingen	169	9·2	Erlangen	28	2·6
Freiburg	164	9·4	Rostock ...	13	2·0
Königsberg	134	11·7	Kiel	12	1·4
Strassburg	96	5·8	Munster ...	11	0·7
Bonn ...	88	2·9			

These foreign students are taking as their chief studies :—evangelical theology, 185; Catholic theology, 34; law, 580; medicine, 1080; philosophy, languages, or history, 951; mathematics and science, 714; agricultural sciences, forestry, &c., 573; dentistry, 24.

STANDARD ELECTRIC GLOW LAMPS.

THE report of the Engineering Standards Committee on the British standard specification for carbon filament glow lamps, which has recently been issued, is of great interest, more especially as it has been published at a time when so many important papers and discussions on carbon and metallic filament lamps are occupying the attention of men of science and engineers. The specification gives at the beginning a list of standards and definitions, and goes on to state what the committee has decided as to the tests a standard lamp shall comply with. A lamp of 12 candle-power is suggested in addition to the usual 8, 16, 25, and 32, and this should prove a very useful size; although it has already been used, it has not been kept as a stock lamp usually. The standard lamps are to be divided into two classes, having a useful life of 400 and 800 hours respectively, and all lamps purporting to be British standard lamps are to be marked with the trade mark or name of manufacturer, the standard mean horizontal candle-power, the voltage, and a reference letter in a circle, which is to show which class—whether 400 or 800 hours—the lamp is intended for. This reference letter is, we think, a mistake, as the ordinary consumer will not know to what it refers, and we do not see the objection to marking plainly on the lamp the useful life hours. The insulation resistance between cap and filament seems to us to be rather high (1000 megohms). The limits for mean horizontal candle-power and total watts, on the other hand, allow plenty of margin, but doubtless these will be reduced after the standards have come into force, which we understand they will do in July next. At present, however, we do not see that the ordinary consumer will benefit very greatly by the specification when it does come into force, for, as we pointed out a few months back, unless the borough councils or local authorities erect special testing laboratories where tests on lamps can be carried out by an expert for a very small fee, or even free of cost, the ordinary consumer will be in practically the same position as he is at present. Of course, the fact of his being able to ask for a standard lamp may tend to make the article sold him slightly better, and with truer candle-power and consumption figures marked on; still, we are afraid that, from the consumer's point of view, until he can get his lamps tested locally, not very much improvement will be seen. The report is, however, of very great interest to those connected with that branch of the electrical profession, and is certainly a long step in the right direction.